

**BRIEF REPORT**

**Frequency andSeverity of the Dawn Phenomenon in Type 2 Diabetes**

Relationship to age

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**OBJECTIVE**—To know whether age has an independent effect on the dawn phenomenon in noninsulin-using type 2 diabetes.

**RESEARCH DESIGN AND METHODS**—Eighty-one individuals with type 2 diabetes were matched for HbA1c, and divided by age into three subgroups of 27 individuals (1: ≥70 years; 2: 60–69 years; and 3: ≤59 years). All underwent ambulatory continuous glucose monitoring for quantifying the dawn phenomenon (i.e., the absolute [ΔG, mg/dL] or relative [ΔG%] increments from nocturnal nadirs to prebreakfast time points).

**RESULTS**—HbA1c levels and 24-h glycemic profiles were similar across the three groups. Glucose increments (mean ± SEM) were identical in the three groups: ΔG (mg/dL), 22.0 ± 4.7 (1), 21.3 ± 3.6 (2), 18.0 ± 3.6 (3); and ΔG (%), 19.9 ± 4.9 (1), 21.6 ± 4.4 (2), and 17.6 ± 4.2 (3). Using the most common definition (ΔG >10 mg/dL), the prevalence of the dawn phenomenon was 52, 70, and 59% in groups 1, 2, and 3, respectively.

**CONCLUSIONS**—The dawn phenomenon is present in the elderly.
CONCLUSIONS—The frequency of the dawn phenomenon did not differ when the subjects with type 2 diabetes were compared by age. In addition, the mean magnitude of blood glucose rise in the early morning from nocturnal nadirs to prebreakfast values did not show any difference among the groups and was equal to \(~20\text{ mg/dL}\). One of the main strengths of the current study is that the quantification of the dawn phenomenon was assessed with continuous glucose monitoring systems that permit calculation of the absolute differences between nocturnal nadirs and prebreakfast glucose values with an accuracy not previously available (11–13).

Reverting to the frequency of the dawn phenomenon across categories of age, it must be noted that the percentages are similar for the different definitions that were used. As a consequence, this dysglycemic state should be taken into consideration in the treatment of individuals with type 2 diabetes, even of those who are >70 years of age. This position is reinforced by the fact that the dawn phenomenon is usually followed by an abnormally high postbreakfast glucose excursion, which corresponds to what is commonly referred to as the extended dawn phenomenon (11), a dysglycemic disorder that can be simply explained by the remnant effect of the hepatic glucose overproduction during the morning period (14) in combination with the dietary intake of carbohydrates at breakfast time. The dawn and extended dawn phenomena are both weak links in the management of many individuals with type 2 diabetes (11).

The glycemic patterns as observed in the current study demonstrate that both phenomena are evident in elderly type 2 diabetic subjects >70 years old to the same extent as those who are <70 years old.

In conclusion, failing to address the dawn and extended dawn phenomena can contribute to inadequate overall glycemic control and increase the risk for development or progression of diabetes complications even in the elderly. Due to the small size of the investigated population, the present results warrant further investigation.

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The dawn phenomenon with aging in diabetes

Figure 1—Twenty-four-hour continuous glycemic profiles (A) and prevalence of the dawn phenomenon expressed as percentage (B) in the three groups of patients divided according to whether ages were: ≥70 years (group 1, blue curve or columns), 60–69 years (group 2, red curve or columns), and ≤59 years (group 3, green curve or columns). The prevalence of the dawn phenomenon was calculated for the three definitions that were used: $\delta G > 10\text{ mg/dL}$, $\delta G > 20\text{ mg/dL}$, and $\delta G > 6.9\%$. The mean breakfast time in the population considered as a whole is indicated by the vertical arrow (7:45 A.M.) with an SD of 35 min.